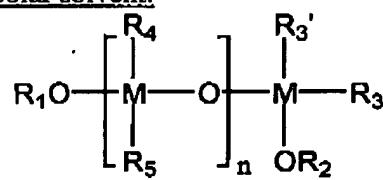


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CLAIM AMENDMENTS

Claims 1-8. (Cancelled)

9. (Currently Amended) The spray-coated layer composition of claim 8 A spray-coated layer composition comprising a metal compound of formula (1) below, fluoroalkylsilane of formula (2) below, a mercapto compound of formula (3) or (4) below, and a polar solvent:



... (1)

where M is selected from the group consisting of Si, Ti, Sn, and Zr;

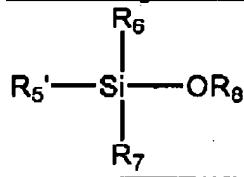
R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

R₂ is a C₁-C₂₀ alkyl group;

at least one of R₃ and R₃' is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;

at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and

n is an integer from 0 to 20.



... (2)

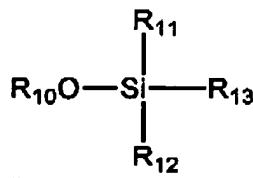
where R₅' is a fluorinated C₁-C₂₀ alkyl group; R₆ and R₇ are, independently, a C₁-C₂₀ alkoxy group or a fluorinated C₁-C₂₀ alkyl group; and R₈ is a C₁-C₂₀ alkyl group,

R₉ SH

... (3)

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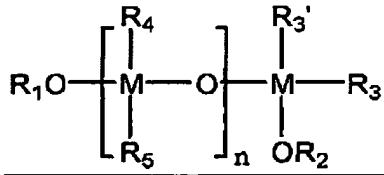
where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and



...(4)

where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, wherein the fluoroalkylsilane of said formula (2) is at least one selected from the group consisting of heptadecafluorodecyltrimethoxysilane, pentadecafluorohexyltrimethoxysilane, heptadecafluorodecyltrimethoxysilane, heptadecafluorodecyltriisopropoxysilane, heptadecafluorodecyltributoxysilane, di-(heptadecafluorodecyl)diethoxysilane di-(heptadecafluorodecyl) diethoxysilane, and tris-(heptadecafluorodecyl)ethoxysilane, and the fluoroalkylsilane fluoroalkylsilane of said formula (2) is contained in an amount of 1-15 parts by weight based on 100 parts by weight of the metal compound of formula (1).

10. (Currently Amended) The spray-coated layer composition of claim 8, A spray-coated layer composition comprising a metal compound of formula (1) below, fluoroalkylsilane of formula (2) below, a mercapto compound of formula (3) or (4) below, and a polar solvent:



...(1)

where M is selected from the group consisting of Si, Ti, Sn, and Zr;

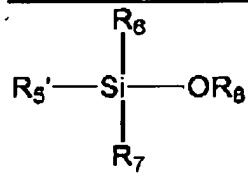
R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

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R₂ is a C₁-C₂₀ alkyl group;

at least one of R₃ and R_{3'} is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;
at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and

n is an integer from 0 to 20.

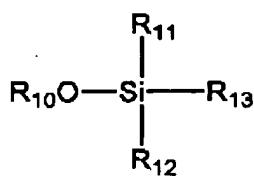


...(2)

where R_{5'} is a fluorinated C₁-C₂₀ alkyl group; R₆ and R₇ are, independently, a C₁-C₂₀ alkoxy group or a fluorinated C₁-C₂₀ alkyl group; and R₈ is a C₁-C₂₀ alkyl group.

R₉ SH ... (3)

where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxyalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and



...(4)

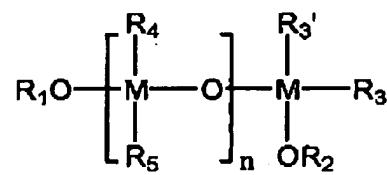
where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, wherein the mercapto compound of said formula (3) or (4) is at least one selected from the group consisting of 3-mercaptopropyltrimethoxysilane, 3-mercaptopropylmethyldimethoxysilane, 3-mercato-1,2-propanediol, 1-mercaptop-2-propanol, 3-mercaptopropionic acid, di-(3-mercaptopropyl)dimethoxysilane, and tris-(3-

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mercaptopropyl)methoxysilane, and the mercapto compound is contained in an amount of 1-15 parts by weight based on 100 parts by weight of the metal compound of said formula (1).

Claims 11-16. (Cancelled)

17. (Currently Amended) The transparent conductive layer of claim 16, A transparent conductive layer comprising a conductive layer containing a metal oxide and a protective layer formed on the conductive layer, the protective layer containing a hydrolyzed and polycondensated product of a metal compound of formula (1) below and at least one of a mercapto compound of formula (3) or (4) below and its hydrolyzed and polycondensated product:



... (1)

where M is selected from the group consisting of Si, Ti, Sn, and Zr;

R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

R₂ is a C₁-C₂₀ alkyl group;

at least one of R₃ and R_{3'} is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;

at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and

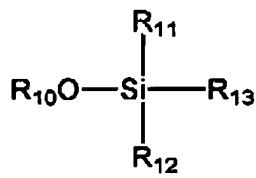
n is an integer from 0 to 20,

R₉ SH

... (3)

where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and

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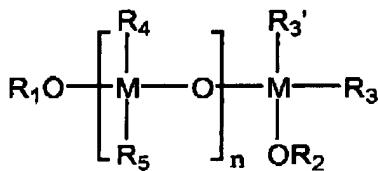


...4)

where R_{10} is a $\text{C}_1\text{-}\text{C}_{20}$ alkyl group; R_{11} and R_{12} are, independently, a $\text{C}_1\text{-}\text{C}_{20}$ alkyl group, a $\text{C}_1\text{-}\text{C}_{20}$ alkoxy group, or a $\text{C}_1\text{-}\text{C}_{20}$ alkyl group with a mercapto group; and R_{13} is a $\text{C}_1\text{-}\text{C}_{20}$ alkyl group with a mercapto (-SH) group, wherein the mercapto compound of said formula (3) or (4) is at least one selected from the group consisting of 3-mercaptopropyltrimethoxysilane, 3-mercaptopropylmethyldimethoxysilane, 3-mercaptopropanediol, 1-mercaptopropanol, 3-mercaptopropionic acid, di-(3-mercaptopropyl)dimethoxysilane, and tris-(3-mercaptopropyl)methoxysilane, and the mercapto compound is contained in an amount of 1-15 parts by weight based on 100 parts by weight of the metal compound of said formula (1).

Claims 18-21. (Cancelled)

22. (Currently Amended) The transparent conductive layer of claim 21, A transparent conductive layer comprising a conductive layer containing a metal oxide and a protective layer formed on the conductive layer, the protective layer containing a hydrolyzed and polycondensated product of a metal compound of formula (1) below and at least one of a mercapto compound of formula (3) or (4) below and its hydrolyzed and polycondensated product:



...1)

where M is selected from the group consisting of Si, Ti, Sn, and Zr;

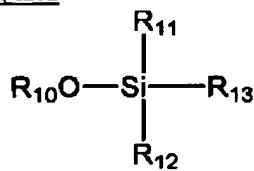
R_1 is a $\text{C}_1\text{-}\text{C}_{20}$ alkyl group or $-\text{M}(\text{R}_{14}\text{R}_{15}\text{R}_{16})$ where R_{14} , R_{15} , and R_{16} are, independently, a $\text{C}_1\text{-}\text{C}_{20}$ alkyl group, a $\text{C}_1\text{-}\text{C}_{20}$ alkoxy group, or a $\text{C}_6\text{-}\text{C}_{20}$ aryl group;
 R_2 is a $\text{C}_1\text{-}\text{C}_{20}$ alkyl group;

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at least one of R₃ and R_{3'} is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;
at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and
n is an integer from 0 to 20.

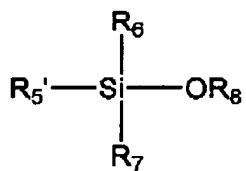
R₉ SH ... (3)

where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and



... (4)

where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, the transparent conductive layer further comprising, on the protective layer, a spray-coated layer containing a hydrolyzed and polycondensated product of the metal compound of said formula (1), at least one of fluoroalkylsilane of formula (2) below and its hydrolyzed and polycondensated product, and at least one of a mercapto compound of said formula (3) or (4) and its hydrolyzed and polycondensated product;



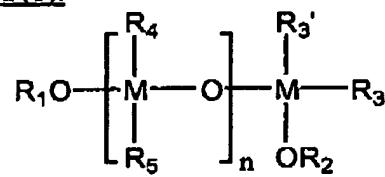
... (2)

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where R₅' is a fluorinated C₁-C₂₀ alkyl group; R₆ and R₇ are, independently, a C₁-C₂₀ alkoxy group or a fluorinated C₁-C₂₀ alkyl group; and R₈ is a C₁-C₂₀ alkyl group, wherein the spray-coated layer is formed as a non-continuous layer.

Claims 23-24. (Cancelled)

25. (Currently Amended) The transparent conductive layer of claim 24, A transparent conductive layer comprising a conductive layer containing a metal oxide and a protective layer and spray-coated layer sequentially formed to protect the conductive layer, the spray-coated layer containing a hydrolyzed and polycondensated product of a metal compound of formula (1) below, at least one of fluoroalkylsilane of formula (2) below and its hydrolyzed and polycondensated product, and at least one of a mercapto compound of formula (3) or (4) below and its hydrolyzed and polycondensated product, and the protective layer containing a hydrolyzed and polycondensated product of the metal compound of said formula (1):



...(1)

where M is selected from the group consisting of Si, Ti, Sn, and Zr;

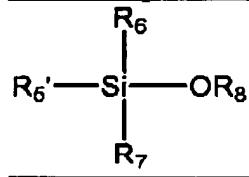
R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

R₂ is a C₁-C₂₀ alkyl group;

at least one of R₃ and R₃' is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;

at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and

n is an integer from 0 to 20.



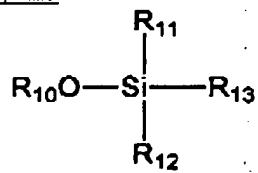
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...(2)

where R₅' is a fluorinated C₁-C₂₀ alkyl group; R₆ and R₇ are, independently, a C₁-C₂₀ alkoxy group or a fluorinated C₁-C₂₀ alkyl group; and R₈ is a C₁-C₂₀ alkyl group.

R₉ SH ... (3)

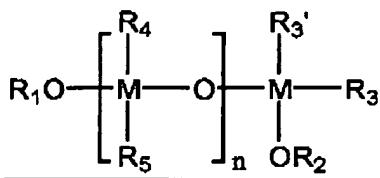
where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxyalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and



...(4)

where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, wherein the spray-coated layer is formed as a non-continuous layer.

26. (Currently Amended) The transparent conductive layer of claim 24, A transparent conductive layer comprising a conductive layer containing a metal oxide and a protective layer and spray-coated layer sequentially formed to protect the conductive layer, the spray-coated layer containing a hydrolyzed and polycondensated product of a metal compound of formula (1) below, at least one of fluoroalkylsilane of formula (2) below and its hydrolyzed and polycondensated product, and at least one of a mercapto compound of formula (3) or (4) below and its hydrolyzed and polycondensated product, and the protective layer containing a hydrolyzed and polycondensated product of the metal compound of said formula (1);



...(1)

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where M is selected from the group consisting of Si, Ti, Sn, and Zr;

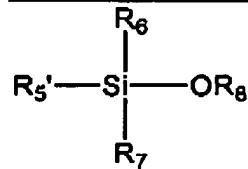
R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are,
independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

R₂ is a C₁-C₂₀ alkyl group;

at least one of R₃ and R₃' is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-
C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;

at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀
alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and

n is an integer from 0 to 20.

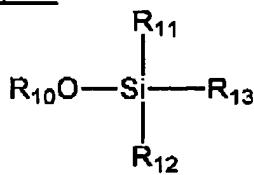


...(2)

where R₅' is a fluorinated C₁-C₂₀ alkyl group; R₆ and R₇ are, independently, a C₁-C₂₀ alkoxy group or a fluorinated C₁-C₂₀ alkyl group; and R₈ is a C₁-C₂₀ alkyl group.

R₉ SH ... (3)

where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxyalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and



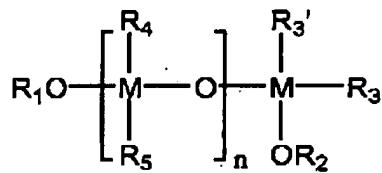
...(4)

where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, wherein the fluoroalkylsilane of said formula (2) is at least one selected from the group consisting of heptadecafluorodecyltrimethoxysilane, pentadecafluorohexyltrimethoxysilane, heptadecafluorodecyltrimethoxysilane,

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heptadecafluorodecyltriisopropoxysilane, heptadecafluorodecyltributoxysilane, di-(heptadecafluorodecyl)diethoxysilane di-(heptadecafluorodecyl) diethoxysilane, and tris-(heptadecafluorodecyl)ethoxysilane, and the fluoroalkylsilane fluoroalkylsilane of said formula (2) is contained in an amount of 1-15 parts by weight based on 100 parts by weight of the metal compound of formula (1).

27. (Currently Amended) The transparent conductive layer of claim 24, A transparent conductive layer comprising a conductive layer containing a metal oxide and a protective layer and spray-coated layer sequentially formed to protect the conductive layer, the spray-coated layer containing a hydrolyzed and polycondensated product of a metal compound of formula (1) below, at least one of fluoroalkylsilane of formula (2) below and its hydrolyzed and polycondensated product, and at least one of a mercapto compound of formula (3) or (4) below and its hydrolyzed and polycondensated product, and the protective layer containing a hydrolyzed and polycondensated product of the metal compound of said formula (1);



...(1)

where M is selected from the group consisting of Si, Ti, Sn, and Zr;

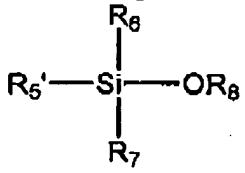
R1 is a C1-C20 alkyl group or -M(R14R15R16) where R14, R15, and R16 are, independently, a C1-C20 alkyl group, a C1-C20 alkoxy group, or a C6-C20 aryl group;

R2 is a C1-C20 alkyl group;

at least one of R3 and R3' is a C1-C20 alkoxy group, and the remaining group is a C1-C20 alkyl group, a C1-C20 alkoxy group, a C2-C20 alkylene group, or a C6-C20 aryl group;

at least one of R4 and R5 is a C1-C20 alkoxy group, and the remaining group is a C1-C20 alkyl group, a C2-C20 alkylene group, or a C6-C20 aryl group; and

n is an integer from 0 to 20.



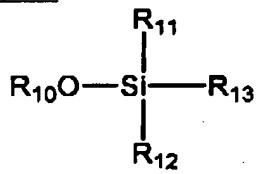
...(2)

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where R_5' is a fluorinated C_1-C_{20} alkyl group; R_6 and R_7 are, independently, a C_1-C_{20} alkoxy group or a fluorinated C_1-C_{20} alkyl group; and R_8 is a C_1-C_{20} alkyl group.

$R_9 SH$... (3)

where R_9 is a C_1-C_{20} alkyl group, a C_1-C_{20} alkyl group with a hydroxy group, a C_1-C_{20} hydroxymethyl group with a hydroxy substituent, or $-(CH_2)_kCOOH$, where k is an integer from 1 to 10, and

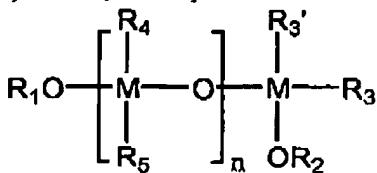


... (4)

where R_{10} is a C_1-C_{20} alkyl group; R_{11} and R_{12} are, independently, a C_1-C_{20} alkyl group, a C_1-C_{20} alkoxy group, or a C_1-C_{20} alkyl group with a mercapto group; and R_{13} is a C_1-C_{20} alkyl group with a mercapto (-SH) group, wherein the mercapto compound of said formula (3) or (4) is at least one selected from the group consisting of 3-mercaptopropyltrimethoxysilane, 3-mercaptopropylmethyldimethoxysilane, 3-mercaptop-1,2-propanediol, 1-mercaptop-2-propanol, 3-mercaptopropionic acid, di-(3-mercaptopropyl)dimethoxysilane, and tris-(3-mercaptopropyl)methoxysilane, and the mercapto compound is contained in an amount of 1-15 parts by weight based on 100 parts by weight of the metal compound of said formula (1).

Claims 28-34. (Cancelled)

35. (New) A spray-coated layer composition comprising a metal compound of formula (1) below, fluoroalkylsilane of formula (2) below, a mercapto compound of formula (3) or (4) below, and a polar solvent:



... (1)

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where M is selected from the group consisting of Si, Ti, Sn, and Zr;

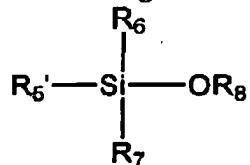
R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

R₂ is a C₁-C₂₀ alkyl group;

at least one of R₃ and R_{3'} is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;

at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and

n is an integer from 0 to 20,



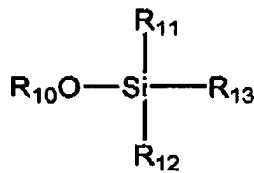
...(2)

where R_{5'} is a fluorinated C₁-C₂₀ alkyl group; R₆ and R₇ are, independently, a C₁-C₂₀ alkoxy group or a fluorinated C₁-C₂₀ alkyl group; and R₈ is a C₁-C₂₀ alkyl group,

R₉ SH

...(3)

where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxyalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and



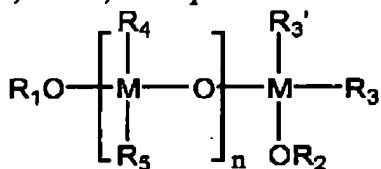
...(4)

where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, wherein the fluoroalkylsilane of said formula (2) is at least one selected from the group consisting of heptadecafluorodecyltrimethoxysilane, pentadecafluorohexyltrimethoxysilane, heptadecafluorodecyltrimethoxysilane,

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heptadecafluorodecyltriisopropoxysilane, heptadecafluorodecyltributoxysilane, di-(heptadecafluorodecyl)diethoxysilane, and tris-(heptadecafluorodecyl)ethoxysilane.

36. (New) A spray-coated layer composition comprising a metal compound of formula (1) below, fluoroalkylsilane of formula (2) below, a mercapto compound of formula (3) or (4) below, and a polar solvent:



...(1)

where M is selected from the group consisting of Si, Ti, Sn, and Zr;

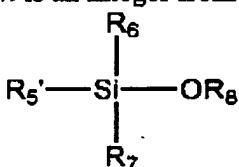
R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

R₂ is a C₁-C₂₀ alkyl group;

at least one of R₃ and R_{3'} is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;

at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and

n is an integer from 0 to 20,



...(2)

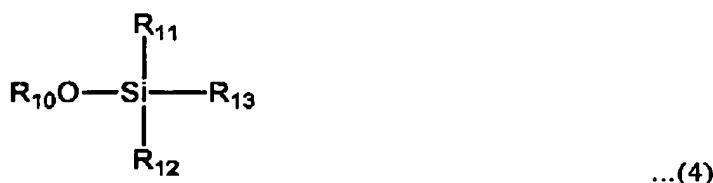
where R_{5'} is a fluorinated C₁-C₂₀ alkyl group; R₆ and R₇ are, independently, a C₁-C₂₀ alkoxy group or a fluorinated C₁-C₂₀ alkyl group; and R₈ is a C₁-C₂₀ alkyl group.

R₉ SH

...(3)

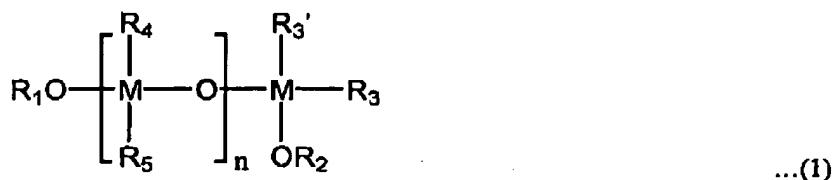
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where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxyalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and



where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, wherein the mercapto compound of said formula (3) or (4) is at least one selected from the group consisting of 3-mercaptopropyltrimethoxysilane, 3-mercaptopropylmethyldimethoxysilane, 3-mercaptop-1,2-propanediol, 1-mercaptop-2-propanol, 3-mercaptopropionic acid, di-(3-mercaptopropyl)dimethoxysilane, and tris-(3-mercaptopropyl)methoxysilane.

37. (New) A transparent conductive layer comprising a conductive layer containing a metal oxide and a protective layer formed on the conductive layer, the protective layer containing a hydrolyzed and polycondensated product of a metal compound of formula (1) below and at least one of a mercapto compound of formula (3) or (4) below and its hydrolyzed and polycondensated product:



where M is selected from the group consisting of Si, Ti, Sn, and Zr;

R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

R₂ is a C₁-C₂₀ alkyl group;

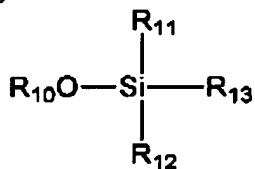
at least one of R₃ and R_{3'} is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;

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at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and
n is an integer from 0 to 20,

R₉SH ... (3)

where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxyalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and

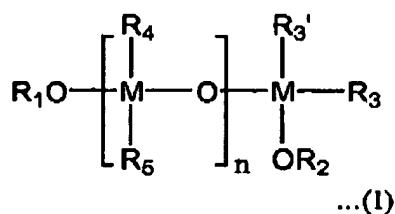


... (4)

where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, wherein the mercapto compound of said formula (3) or (4) is at least one selected from the group consisting of 3-mercaptopropyltrimethoxysilane, 3-mercaptopropylmethyldimethoxysilane, 3-mercato-1,2-propanediol, 1-mercato-2-propanol, 3-mercaptopropionic acid, di-(3-mercaptopropyl)dimethoxysilane, and tris-(3-mercaptopropyl)methoxysilane.

38. (New) A transparent conductive layer comprising a conductive layer containing a metal oxide and a protective layer and spray-coated layer sequentially formed to protect the conductive layer, the spray-coated layer containing a hydrolyzed and polycondensated product of a metal compound of formula (1) below, at least one of fluoroalkylsilane of formula (2) below and its hydrolyzed and polycondensated product, and at least one of a mercapto compound of formula (3) or (4) below and its hydrolyzed and polycondensated product, and the protective layer containing a hydrolyzed and polycondensated product of the metal compound of said formula (1):

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where M is selected from the group consisting of Si, Ti, Sn, and Zr;

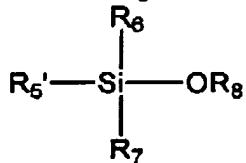
R₁ is a C₁-C₂₀ alkyl group or -M(R₁₄R₁₅R₁₆) where R₁₄, R₁₅, and R₁₆ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₆-C₂₀ aryl group;

R₂ is a C₁-C₂₀ alkyl group;

at least one of R₃ and R_{3'} is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group;

at least one of R₄ and R₅ is a C₁-C₂₀ alkoxy group, and the remaining group is a C₁-C₂₀ alkyl group, a C₂-C₂₀ alkylene group, or a C₆-C₂₀ aryl group; and

n is an integer from 0 to 20,

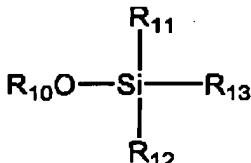


...(2)

where R_{5'} is a fluorinated C₁-C₂₀ alkyl group; R₆ and R₇ are, independently, a C₁-C₂₀ alkoxy group or a fluorinated C₁-C₂₀ alkyl group; and R₈ is a C₁-C₂₀ alkyl group,



where R₉ is a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkyl group with a hydroxy group, a C₁-C₂₀ hydroxyalkyl group with a hydroxy substituent, or -(CH₂)_kCOOH, where k is an integer from 1 to 10, and



...(4)

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where R₁₀ is a C₁-C₂₀ alkyl group; R₁₁ and R₁₂ are, independently, a C₁-C₂₀ alkyl group, a C₁-C₂₀ alkoxy group, or a C₁-C₂₀ alkyl group with a mercapto group; and R₁₃ is a C₁-C₂₀ alkyl group with a mercapto (-SH) group, wherein the mercapto compound of said formula (3) or (4) is at least one selected from the group consisting of 3-mercaptopropyltrimethoxysilane, 3-mercaptopropylmethyldimethoxysilane, 3-mercato-1,2-propanediol, 1-mercaptopropanol, 3-mercaptopropionic acid, di-(3-mercaptopropyl)dimethoxysilane, and tris-(3-mercaptopropyl)methoxysilane.